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ABSTRACT

The purpose of this study was to investigate whether learner-generated or experimenter-provided adjunct practice questions are superior for facilitating recall of lower-order and higher-order textual information. The subjects for this experiment were 74 sixth grade students from three classes, randomly assigned to lower-order and higher-order treatment groups. The study utilized a modified posttest-only design with no control group. Approximately one month prior to the study, the subjects received instruction in generating lower-and higher-order questions by the classroom teacher. Both learner-generated and experimenter-provided adjunct practice questions were shown to be an effective aid in facilitating recall of information compared with reading-only conditions. It was found that experimenter-provided questions yielded superior recall, possibly due either to the fact that the students may not possess the cognitive skills necessary for the task or to a high correlation between the provided questions and the items on the posttest. (Contains 11 references.) (ALF)

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# Effects of Two Practice Strategies on Two Types of Recall

A Research Report Presented at the 1993 Conference of the Association for Educational Communications and Technology New Orleans, Louisiana

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## Introduction

Research into the effectiveness of practice strategies for learners has provided much evidence that adjunct questioning, a strategy where questions are inserted following short sections of information (Sutliff, 1986), is an effective educational tool. Adjunct practice questions have been found to facilitate learner recall and promote a higher degree of learner involvement, even when no feedback or opportunity for review are provided (Duchastel and Nungester, 1984; Watts and Anderson, 1971). Adjunct practice questions have been found to provide superior retention in both adults (Hamilton, 1985) and children (Denner & Rickards, 1987), when compared to reading-only conditions with no questions.

Most studies involving adjunct practice questions and learner recall have examined the effects of experimenter- or text-provided questions (Andre & Thieman, 1988; Duchastel and Nungester, 1984; Hamilton, 1986). However, recent interest in the cognitive processing of learners has produced a growing body of literature about learners generating their own practice questions (Cohen, 1983; Gillespie, 1990). Studies of the effects of learner-generated questions have found facilitating effects (Denner and Rickards, 1987; Gillespie, 1990; Steiner, 1988). In theory, having students generate their own practice questions should require that they focus greater attention on the material, thus increasing recall (Gillespie, 1990). It is hypothesized, therefore, that learner-generated adjunct practice questions would be more effective at facilitating the recall of textual information than experimenter- or text-provided adjunct practice questions.

Steiner (1988), differentiated between the recall of lower-order information and higher-order information. Recall of lower-order information involves remembering simple or factual information (Hamaker, 1986). Questions that begin with "who," "what," "where," and "when" are generally seeking lower-order information. Recalling higher-order information requires greater processing of concepts, procedures, or a synthesis of facts, typified by "how" and "why" questions. The purpose of this study was to investigate whether learner-generated or experimenter-provided adjunct practice questions are superior at facilitating recall of lower- and higher-order textual information.

## Method

### Subjects and Design

The subjects for this experiment were 74 sixth grade students from three classes in a middle class, suburban elementary school in the southwestern United States. They embodied an ethnically mixed group of caucasian, hispanic, black, and asian students. Subjects in each class were randomly assigned to lower-order and higher-order information treatment groups, each containing an *n* of 37.

The design of the study was a 2 (authorship of practice question) X 2 (level of information) factorial which utilized a modified posttest-only design with no control group. The dependent variable was retention of information as measured by performance on an achievement posttest.

### Materials

The instructional materials developed for this study consisted of a 4-page booklet containing 12 paragraphs of text, adapted from a chapter on Hinduism in the students' world history textbook. The text material was rearranged so that each paragraph contained both lower-order and higher-order information, however, the basic content was left unaltered. Six of the paragraphs were each followed by an experimenter-provided practice question and a space to answer the question. The remaining six paragraphs were each followed by lines where subjects could generate their own questions and answers. Although the textual material was identical for both treatments, the booklets given to the lower-order group contained only lower- order provided questions The higher-order instructional materials contained higher-order questions. An example of the two types of questions follows:

| | |
|---|---|
| Lower-order: | What are the four classes in Hinuism? |
| Higher-order: | If you were born a Hindu, how would your class decide your way of life? |

### Criterion Measure

The criterion measure was a 24-item posttest, administered one day following the instructional activity. Subjects did not have an opportunity to review the instructional material before taking the test. Test items included one lower-order and one higher-order item for each of the 12 paragraphs in the instructional booklet. En route data of the time required for each subject to complete the examination was also measured. Five students who were absent the previous day and did not receive the instructional materials took the posttest and were unable to answer any of the 24 test items correctly. Internal consistency of the posttest was calculated by using the split-half reliability and Spearman-Brown prophecy formulas, which yielded a correlation coefficient of .83.



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Procedures

Approximately one month prior to the study, the subjects received instruction in the generating of lower- and higher-order questions by their classroom teacher. The teacher differentiated between "factual" (lower-order) and "conceptual" (higher-order) questioning techniques and modeled how to generate the different kinds of questions. The subjects were given opportunities to practice questioning skills in class and on homework assignments.

Before administering the instructional materials, the subjects were given a brief review in the difference between "factual" and "conceptual" questions. Subjects in the lower-order question treatment were directed to compose lower-order questions while subjects in the higher-order treatment were directed to compose higher-order questions. The subjects were directed to write answers for all 12 questions.

## Results

Posttest means for experimenter-provided and learner- generated practice questions are shown in Table 1. Data for posttest achievement were analyzed using a 2 X 2 factorial analysis of variance. One- and two-way analysis of variance showed a significant effect for authorship of adjunct practice questions at both lower $F(1,72) = 8.87$, $p<.01$, $MSe = 2.20$ and higher $F(1,72) = 10.59$, $p<.01$, $MSe = 2.47$ information levels. The mean scores of the experimenter-provided group were found to be significantly higher than those for the learner-generated group. No significant effects for level of practice question and gender were reported. No significant interaction effects were reported. These results fail to support the hypothesis that generating adjunct practice questions would be superior at facilitating recall when compared to experimenter-provided practice questions.

Subjects in the lower-order group took an average of 5.48 minutes to answer the provided questions and 9.49 minutes to generate questions. Those in the higher-order group took an average of 7.58 minutes to answer the questions and took 12.03 minutes to generate questions.

TABLE 1: Recall by Level and Authorship of Adjunct Practice Questions

| | | Authorship | | |
|---|---|---|---|---|
| Level of Information | | Provided | Generated | Total |
| Lower-Order | M | 3.92 | 2.89 | 6.81 |
| | SD | 1.57 | 1.39 | 2.84 |
| Higher-Order | M | 4.03 | 2.84 | 6.87 |
| | S | 1.38 | 1.57 | 2.65 |
| Total | M | 7.95 | 5.73 | 13.68 |

## Discussion

Both provided and generated adjunct practice questions have been shown to be an effective aid in facilitating recall of text information when compared with a reading-only conditions. Because of the increased cognitive activity required to generate questions, it was hypothesized that sixth grade learners who generated their own practice questions would enjoy superior recall than when they answered provided practice questions. The findings of this study, however, support the superiority of provided questions over generated questions for sixth graders. This finding is consistent with Denner and Rickards (1987), who found that fifth graders recalled subordinate and superordinate details better with provided than with generated questions. This finding, however, was reversed with eighth graders. This result could be due to the fact that sixth graders are more like fifth graders, who may not yet possess the cognitive skills necessary to for the task of generating and encoding interrogatory information.

These results may be due to a high correlation which existed between the provided questions and the items on the posttest. Students who generate practice questions dissimilar to those on the test will be working under a handicap, rather than an advantage. This handicap can be lessened greatly by providing learners with opportunities to receive feedback regarding the quality of their questions, and the chance to revise questions prior to utilizing them for recall practice. The desirability of maintaining a learner-generated adjunct questioning strategy, including extra time for feedback and revision, is an issue that must be decided upon by the individual instructor.

For sixth grade learners, providing questions appears to afford more effective and efficient recall than having the learners generate them. Since adjunct practice questions have been successful as a strategy for learner recall of text information, their continued usage as an instructional strategy is recommended.

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